FEDERAL PUBLIC SERVICE COMMISSION

COMPETITIVE EXAMINATION-2024 FOR RECRUITMENT

TO POSTS IN BS-17 UNDER THE FEDERAL GOVERNMENT

Roll Number

PHYSICS PAPER-I

TIME ALLOWED: THREE HOURS **PART-I(MCQS): MAXIMUM 30 MINUTES**	**PART-I (MCQS) MAXIMUM MARKS = 20** **PART-II MAXIMUM MARKS = 80**

NOTE: (i) **Part-II** is to be attempted on the separate **Answer Book.**

(ii) Attempt **ONLY FOUR** questions from **PART-II. ALL** questions carry **EQUAL** marks.

(iii) All the parts (if any) of each Question must be attempted at one place instead of at different places.

(iv) Candidate must write Q. No. in the Answer Book in accordance with Q. No. in the Q. Paper.

(v) No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.

(vi) Extra attempt of any question or any part of the attempted question will not be considered.

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Roll Number

PHYSICS, PAPER-I

TIME ALLOWED: THREE HOURS	(PART-I MCQs) MAXIMUM MARKS: 20
PART-I (MCQs) : MAXIMUM 30 MINUTES	(PART-II) MAXIMUM MARKS: 80

NOTE: (i) First attempt **PART-I (MCQs)** on separate **OMR Answer Sheet** which shall be taken back after **30 minutes.**
(ii) **Overwriting/cutting of the options/answers will not be given credit.**
(iii) There is **no negative** marking. All MCQs must be attempted.

PART-I (MCQs)(COMPULSORY)

Q.1. (i) Select the best option/answer and fill in the appropriate Box ■ on the **OMR Answer Sheet.(20x1=20)**
(ii) Answers given anywhere else, other than OMR Answer Sheet, will not be considered.

1. **What is the magnitude of the vector, $12i - 8j - 24k$?**
(A) 18 (B) 28 (C) 38 (D) 48
2. **Moment of inertia of solid sphere is:**
(A) $2/3\ Mr^2$ (B) $\frac{1}{2}\ Mr^2$ (C) $2/5\ Mr^2$ (D) None of these
3. **Radial component of velocity for a particle moving in a circular path is:**
(A) Constant (B) Radius itself (C) Variable (D) Zero
4. **The linear thermal coefficient of a solid is less than its volume thermal expansion coefficient by a factor of:**
(A) 3/2 (B) 3 (C) 9 (D) 6
5. **A body is thrown vertically upwards from the ground with a speed of 980 cm/sec. It will rise to a height of:**
(A) 980 cm (B) 490 cm (C) 49 cm (D) None of these
6. **Optically active crystals rotate the:**
(A) Vibrating plane (B) Interference plane (C) Polarization plane (D) Diffraction plane
7. **A sound source of frequency 600 Hz is moving towards an observer with velocity 20 m/s. The speed of sound is 340 m/s. The frequency herd by observer will be :**
(A) 30 Hz (B) 63.5 Hz (C) 637.5 Hz (D) None of these
8. **A system consisting of two particles moves on a plane. Then the degree of freedom is:**
(A) 2 (B) 3 (C) 4 (D) 6
9. **Projection of vector A in the direction of x-axis is represented by the angle of:**
(A) Cos (B) Sin (C) Tan (D) None of these
10. **When the movable mirror of a Michaelson Interferometer is shifted through 0.0589 mm, 200 fringes cross the fiel(D) What is the wavelength of the light?**
(A) 5890 Å (B) 5245 Å (C) 4965 Å (D) None of these
11. **The frequency of 2nd pendulum is:**
(A) 1.5 Hz (B) 2 Hz (C) 0.5 Hz (D) 1 Hz
12. **A skater moves with a constant velocity of 12km/s. If her momentum is 600kgm/s, what is its mass?**
(A) 72kg (B) 0.05kg (C) 50kg (D) 46kg
13. **The escape velocity from the surface of the earth is approximately equal to:**
(A) 9.81 km/sec (B) 11.2 km/sec (C) 14 km/sec (D) None of these
14. **The value of relative permittivity for all the dielectrics is:**
(A) Less than unity (B) Zero (C) Equal to unity (D) Greater than unity
15. **When travelling wave is a sin or cos function of (x+Vt) is called:**
(A) Plane progressive wave (B) Non-harmonic wave (C) Wave function (D) None of these
16. **A particle on the trough of a wave at any instant will come to the mean position after a time:**
(A) T/2 (B) T/4 (C) T (D) 2T
17. **The efficiency of a heat engine working between the freezing point and boiling point of water is:**
(A) 6.25% (B) 0% (C) 26.8% (D) 100%
18. **Wavelength of an incident light when it is incident normally on a diffraction grating, having 3000 lines per centimeter and angular separation of 10° is:**
(A) 500 nm (B) 650 nm (C) 580 nm (D) 600 nm
19. **Which of the following have highest value of surface tension?**
(A) Water (B) Mercury (C) Milk (D) Oil
20. **The dimensions of work are:**
(A) MT^{-1} (B) MLT^{-1} (C) M^2L^2T (D) ML^2T^{-2}

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PHYSICS, PAPER-I

PART-II

NOTE: (i) **Part-II** is to be attempted on the separate **Answer Book.**
(ii) Attempt **ONLY FOUR** questions from **PART-II. ALL** questions carry **EQUAL** marks.
(iii) All the parts (if any) of each Question must be attempted at one place instead of at different places.
(iv) Write Q. No. in the Answer Book in accordance with Q. No. in the Q.Paper.
(v) No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
(vi) Extra attempt of any question or any part of the question will not be considered.
(vii) **Use of Calculator is allowed.**

Q.2. (a) State and prove Stoke's Theorem. Also explain its significance. **(6, 4)**
(b) A particle moves in xy plane so that its x and y coordinates vary with time according to $x(t)=At^3 + Bt$ and $y(t)=Ct^2+D$. where A=1.00 m/s^3 B= -32 m/s C= 5 m/s^2 and D=12m. Find the position, velocity and acceleration of the particle when t=3 s. **(10)** **(20)**

Q.3. (a) What is relativity of length according to Einstien? Also discuss concequences of lorentz transformation for relativity. **(5, 5)**
(b) Prove $E^2= m^2c^4+P^2c^2$. **(5)**
(c) Derive formula for work and kinetic energy in rotational motion. **(5)** **(20)**

Q.4. (a) What is conservative field? Prove that gravitational force is negative derivative of potential energy. **(10)**
(b) Find the direction cosines of Cartesian coordinates (2,-1, 2). **(4)**
(c) Calculate which is greater, angular momentum of earth associated with its rotation about its own axis or angular momentum of earth associated with its orbital motion around sun. Radius of the earth=6400 km and radius of the orbit of the earth about the sun is equal to 1.5×10^8km. **(6)** **(20)**

Q.5. (a) Write in detail about the variation of pressure in a fluid at rest and in the atmosphere with relevant mathematical formulas. **(7, 7)**
(b) The siren of a police car emits a pure tone at frequency 1125 Hz find the frequency that you perceive in your car when you moving at 9m/s, police car chasing behind you at 38 m/s. **(6)** **(20)**

Q.6. (a) If two waves having same amplitude and are propagating in opposite directions through a string, will they produce standing waves? Is energy transported, and are there any nodes? **(10)**
(b) How dispersion and resolving power of a grating can be calculated in terms of wavelength? **(10)** **(20)**

Q.7. (a) Differentiate between real and ideal gas. Describe about work done on ideal gas in thermal isolation. **(10)**
(b) A heat pump acting as a refrigerator is used to heat a house. The temperature outside the house is -9°C and inside is kept at 21°C. Find the maximum coefficient of performance of the heat pump? **(6)**
(c) What do you know about fermi-Dirac statistics? **(4)** **(20)**

Q.8. Write Comprehensive note on any two of the followings: **(10 each)** **(20)**

(a) Damped harmonic motion

(b) Young Double Slit Experiment

(c) Longitudinal and transverse coherence

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